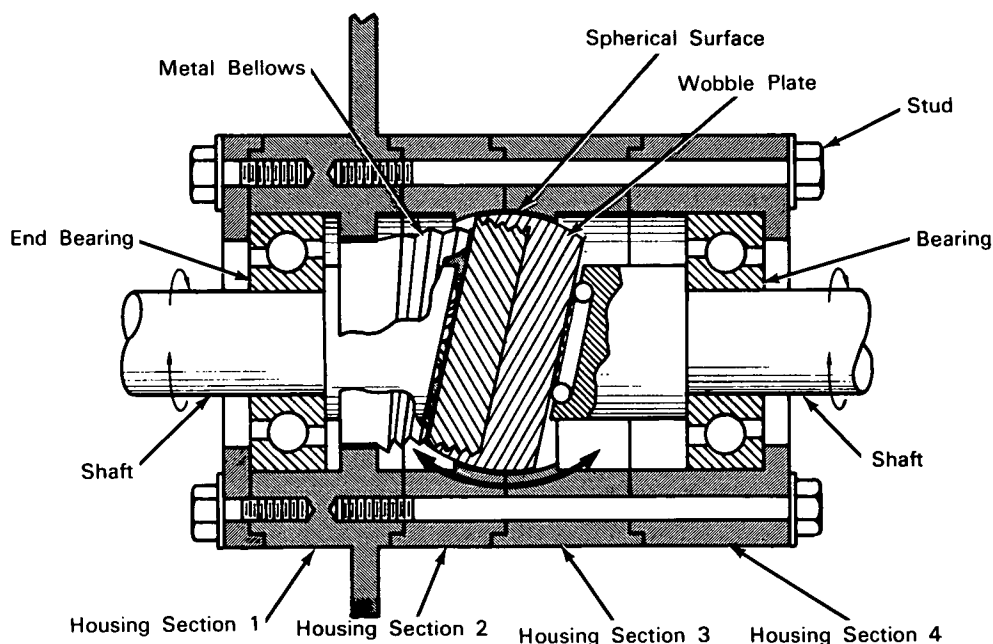


NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

Device Transmits Rotary Motion Through Hermetically Sealed Wall



The problem: Transmitting rotary motion through a wall hermetically separating two enclosures or environments. Most presently available devices, such as stuffing boxes, lip seals, and labyrinth seals do not provide true hermetic seals, and in addition, offer considerable frictional resistance to shaft rotation at the sealing surfaces.

The solution: A device incorporating a wobble plate, a metal bellows, and two shafts (one driving, one driven) which make driving contact with two faces of the wobble plate by means of ball bearings.

How it's done: Two shafts mounted in endbearing races, the wobble plate, and metal bellows are

assembled in a housing which is comprised of four sections (1, 2, 3, 4, above). That part of each shaft which extends externally from the endbearing race is about one half of the diameter of the part which is contained inside the housing. The diagonal surface of the large part of each shaft has an annular recess containing a circular ballbearing race. The wobble-plate assembly contained between the diagonal surfaces of the two shafts consists of two portions. One portion is a flat disc having male threads around its periphery, and the other is a spherical section with a flange having female threads. One end of the metal bellows is rigidly attached and hermetically sealed to the disc portion of the wobble plate, and the other end of the

(continued overleaf)

bellows is similarly attached to section 1 of the housing.

In operation, rotary motion of the driving shaft is transmitted by the ball bearings in the diagonal surface of the shaft to the wobble plate, which in turn imparts a rotary motion to the driven shaft. The concave spherical surface in the housing (in which the spherical periphery of the wobble plate rides) restricts the longitudinal motion of the wobble plate, and the bellows restricts rotational movement of the plate. The resultant rotational torque developed by the wobble plate is due to its universal oscillation or rocking motion.

The torque transmitting capabilities of this device are increased by making the bearing surfaces

presented to rock the wobble plate as large as possible.

Note:

The device could be used to eliminate shaft leakage in pumps, contain lubricants in gear boxes and motors, or prevent leakage along propeller shafts on ships. It may also be used to operate valves or other control mechanisms in hermetically sealed systems including those containing toxic, corrosive, or combustible materials.

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Richard N. Porter
Jet Propulsion Laboratory (JPL-303)